How old are you really?

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Tavi Gevinson. *Photo: Jonathan Leibson*

Why don't people believe us when we say we're only 30? How do they know we're not? And why can two people the same age look and feel totally different? The number of candles on our birthday cake is not a reliable indicator of our biological age. To determine our biological age, we need to look at a range of factors covering physical, mental and functional parameters and compare them with other people the same age.

No consensus exists on a standard set of ageing biomarkers or their role in determining outcomes in individuals. Anti-ageing practitioners have traditionally considered the risk factors and early signs of disease as the most convenient way to measure biological age. However, while the presence of disease is important, the absence of disease does not guarantee quality of life or longevity. Biological age is also not the same thing as our health status. However, the healthier we are, the more likely we are to be 'biologically' younger than if we were unhealthy. There are many things we can do to be more healthy, and to have a positive impact on ageing. Biological age looks at current functions, as well as how much we've got left in the tank. With this knowledge, we can anticipate, and potentially control, what happens next.

Assessing some of the factors that drive our ageing can be very useful. For example, levels of oxidative stress, inflammation, stress or hormone levels can help us determine why we are ageing and provide specific targets for intervention.

Cholesterol

Cholesterol levels are a good predictor of longevity. Keeping them at optimal levels is an important way to prevent heart disease. Our levels of bad cholesterol (low density lipoproteins, or LDL) rise as we get older. The higher our LDL cholesterol levels, the higher our risk of heart attack and other diseases that shorten life expectancy. Levels of good cholesterol contained in high density lipoprotein (HDL) particles are used as a marker of the body's ability to remove bad cholesterol from blood vessels and transport it to safer storage sites. The higher our HDL cholesterol, the higher our capacity to reduce the effects of bad

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cholesterol, lowering our risk of heart disease.

Glucose control

The ability to maintain glucose levels in an optimal range is another key requirement for health and longevity. This ability erodes as we get older, leading to impaired glucose tolerance and the onset of diabetes. Long before we reach this stage, it is possible to detect any loss of function with a glucose tolerance test (GTT). Elevated levels of insulin denote a resistance to its effects. This is an early sign that the system is under strain, just like driving a car with the handbrake half on. Unless rectified, it will lead to loss of function. Another way to look at the body's capacity for sugar regulation is to measure the level of sugar modification on haemoglobin (called the HbA1c). The higher our HbA1c, the more sugar our body has been exposed to and the more susceptible we are to type 2 diabetes.

Kidney function

The kidneys filter the blood, clearing it of toxins and maintaining the balance of our inner sea. Fortunately, we have two kidneys, providing a considerable buffer against losses due to ageing. People with impaired kidney function tend to accumulate toxins, such as AGEs, free radicals and damaged fats. This can accelerate ageing and many of the symptoms and diseases of old age. Even small changes in kidney function are associated with a risk of premature mortality. The capacity to filter the blood and clear it of toxins is estimated by measuring our Glomerular Filtration Rate (GFR). Another sign of early kidney damage is the presence of proteins, such as albumin in the urine, where they are not normally found. Increased levels of albumin in the urine, or a reduced GFR, are associated with early death, and those people with the highest levels of albumin excretion (albuminuria) and lowest GFR have the worst prognosis.

Body composition

Body composition is a key determinant of future health. Being overweight or obese shortens many lives. Weight has traditionally been used as a marker of fatness and is an easy way to track the success of diet and exercise programs. The most widely used measure of body composition is the body mass index (BMI), which is our weight (in kilograms) divided by our height (in metres) squared. However, BMI does not take into account muscle mass, which can be very different in different people. For example, muscle loss as we get older can result in a lower BMI, and therefore complacency, yet body composition may still be highly abnormal.

An alternative is to simply measure our waist circumference with a tape measure at a point two finger breadths above the top of our hip bone. The deposition of fat around the waist, and particularly around the organs inside, is currently the best marker of compositional changes that result from too many calories and not enough exercise.

Abdominal obesity is present if our waistline is: Men > 102 cm; Women > 88 cm.

Lung function

Measures of respiratory function show a strong correlation with ageing. As we age, our lungs become stiffer, while the muscles required to expand them become weaker. This can be quantified by measuring how much air we can force out of our lungs in one second (Forced Expiratory Volume in 1 second, or FEV-1) or how much air we can breath in (Forced Vital Capacity, or FVC) using a spirometer. Both these parameters decline at the rate of about 1% per year and can be used as a marker of the ageing process.

Strength and fitness

Age-related declines in muscle mass and strength contribute significantly to age-related disability. By the time we reach our 80s, we have lost up to a third of our skeletal muscle mass. A simple strength test is the hand grip test. We hold a dynamometer in our dominant hand and give it a good squeeze. Adjustment for our height and fat mass further improves the ability of hand grip strength to determine our overall muscle mass.

As survival is generally longer in the fittest people, measuring our fitness level is one way to estimate our biological age. One measure of aerobic fitness is VO2 max. Our body's maximum ability to use oxygen is determined while engaging in graded exercise. The walking test, beep test or step test are the most affordable, available and reliable tests.

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Bone integrity

Thinning of the bones is one of the best-known aspects of ageing. Reduced bone density indicates an increased risk of fracture and possibly osteoporosis. By convention, bone density is compared to our maximum bone density when we are young. This is the T-score. A low T-score generally indicates a loss of bone density. The lower the T-score, the greater the risk of fracture. Bone density is more commonly measured in women, as men have a greater peak bone density and it takes much more bone loss to lead to bone fragility and increased risk of fracture. However, men still experience bone loss and bone density can still be used to track the ageing process. In fact, in both men and women, there is a strong association between changes in bone density and age-related changes in other systems, including the lungs, heart and kidneys. Moreover, when compared to people of a similar age, those with a lower bone density (T-score) have a higher risk of cancer, heart disease and overall mortality.

Brain power

Batteries of cognitive tests that measure thinking power are widely used to examine the impact and rate of ageing. Ageing is associated with a decline in some cognitive tasks, such as short-term memory and spatial awareness. Memory loss, learning and other cognitive skills are highly variable between individuals.

Edited extract from *Fast Living Slow Ageing (Health Inform $39.99),* by Kate Marie and Professor Merlin Christopher Thomas, available now at book stores and online here.

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